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REMARKS

I. STATUS OF THE CLAIMS

Claims 67-102 are pending in the present application, prior to this Amendment. In the Office Action mailed September 21, 2005, claims 67-88 were rejected and claims 89-102 were withdrawn from consideration. Claims 67, 68, 70-72, 74, 76, 80, 84, 86, and 87 are amended hereby. Please add new claims 103 and 104. Please cancel claim 81. No new matter is presented hereby.

II. CLAIM REJECTIONS UNDER 35 U.S.C. §103

A. Rejection of claims 67-75 and 84-88

Claims 67, 84, and 86 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,732,762 to *Usui et al.* in view of U.S. Patent No. 5,327,955 to *Easwaran*. Additionally, claims 68-73, 75, and 85 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Usui et al.* in view of *Easwaran* and further in view of U.S. Patent No. 6,241,000 to *Conroy et al.* Further, claims 74, 87, and 88 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Usui et al.* in view of *Easwaran* and further in view of U.S. Pat. Nos. 5,294,094 and 5,565,046 to *Crafton et al.*

Claims 68-75 depend directly or indirectly from claim 67. Claims 85-88 depend directly or indirectly from claim 84. In view of the amendments to claims 67 and 84, it is believed that these rejections are obviated and should be withdrawn.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference or combination of references must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on the Applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991); MPEP

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§2142. It is submitted respectfully that the cited references are not sufficient to support a *prima facie* case of obviousness.

First, there is no motivation to combine the teachings of *Easwaran* with the teachings of *Usui*. *Easwaran* is directed to a method of forming an "investment-type" mold and heat treating a casting within the mold. A molten metal is poured into a ceramic shell that is supported in a particulate medium. The solidifying metal is maintained at the appropriate heat treatment temperature until the metal is heat treated (col. 5, lines 60-65). There is no mention of using a core to form the casting of *Easwaran*.

In sharp contrast, *Usui* is directed to a method of removing a core from a casting. The method involves alternating steps of vibrating the casting and immersing it into a rinsing bath to removed dislodged pieces of the core (col. 4, lines 13-25). Given that *Easwaran* and *Usui* seek to solve entirely different problems, there is no motivation to combine their teachings. Further, given the apparent differences in the technical fields of *Easwaran* and *Usui*, there is no reasonable expectation that *Easwaran* and *Usui* would result in a successful combination.

Even if the references are combined properly, neither *Easwaran* or *Usui*, nor the combination thereof, teach or suggest all elements of Applicant's claimed invention.

1. Claim 67 (*Usui/Easwaran*)

With respect to amended claim 67, neither *Easwaran* nor *Usui*, nor the combination thereof, teach or suggest a method of processing a metal casting in a mold, where the mold includes a core and at least one access opening extending through the mold to at least a portion of the core. As stated above, there is no mention of using a core to form the casting of *Easwaran*. While *Usui* does teach the use of a core, it does not teach or suggest using a mold having at least one access opening that extends through the mold to at least a portion of the core.

Furthermore, neither *Easwaran* nor *Usui*, nor the combination thereof, teach or suggest a method of processing a metal casting including impinging the core with a heated fluid directed through the access opening, where impinging the core with a heated fluid at least partially degrades the core, at least partially heat treats the casting within the mold, or a

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combination thereof. In contrast, various aspects of the present invention are directed to improved process in which access openings in the mold are used to apply heat directly to the *core* contained within the casting. In doing so, heat may be transferred from the core to the surrounding casting, which then is heat treated from the interior of the casting toward the exterior of the casting. Additionally, the core may begin to degrade, thereby at least partially creating a void in the space originally occupied by the core and delivering more heat directly to the interior of the casting. Likewise, according to another aspect of the invention set forth in claim 68, the *casting* may be impinged directly with a heated fluid directed through an access opening to heat treat the casting. In doing so, heat may be transferred from the casting to the adjacent core, thereby also at least partially degrading the core. **Thus, various aspects of the present invention not only independently provide for heat treatment and core degradation, but also facilitate the two processes being carried out concurrently in a synergistic manner.**

With respect to *Easwaran* and *Usui*, as regards at least partially degrading the core, *Easwaran* does not teach or suggest the use of a core and, therefore, cannot teach impinging the core with a heated fluid to degrade the core at least partially. Instead, *Easwaran* merely teaches use of pressurized water jets to remove the *mold*, in this case a ceramic coating (col. 7, line 3). *Usui* teaches immersing the casting in a bath to rinse off any portions of the core *that are already loose* (col. 4, lines 19-25). There is no mention in *Usui* to using the process claimed in claim 67.

As regards at least partially heat treating the casting, *Easwaran* does not teach or suggest the use of a core and, therefore, cannot teach impinging the core with a heated fluid to heat treat the core at least partially, as set forth in amended claim 67. Instead, the casting of *Easwaran* is heated treated in a fluidized bed (col. 5, lines 23-31) and, therefore, the heat treatment of *Easwaran* is carried out from the exterior of the casting toward the interior of the casting through conduction. The casting of *Usui* likewise does not include a core with at least one access opening, and instead, is heat treated within a heat treatment apparatus using

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radiant tube burners (col. 4, lines 43-44). Thus, the heat treatment of *Usui* also is carried out from the exterior of the casting toward the interior of the casting through conduction.

Given that neither *Easwaran* nor *Usui*, nor the combination thereof, teach or suggest each and every element of Applicant's claimed invention, it is submitted that a *prima facie* case of obviousness cannot be made with respect to amended claim 67.

2. Claims 84 and 86 (*Usui/Easwaran*)

With respect to amended claim 84 and its associated dependent claim 86, neither *Easwaran* nor *Usui*, nor the combination thereof, teach or suggest use of a process control temperature station downstream from the pouring station, where the process control temperature station includes a second heat source for maintaining the metal at or above a process control temperature as the metal at least partially solidifies, where the process control temperature is the temperature below which for every one minute of time the temperature of the casting decreases, more than one minute of heat treatment is required to attain the desired properties of the casting. Thus, it is believed that a *prima facie* case of obviousness cannot be made with respect to claims 84 and 86.

3. Claims 68-73, 75, and 85 (*Usui/Easwaran/Conroy*)

Claims 68-73 and 75 depend directly or indirectly from claim 67, discussed above. Claim 85 depends indirectly from claim 80. In view of the amendments to claims 67 and claim 80, it is believed that the rejection of claims 68-73, 75, and 85 is obviated and should be withdrawn.

Usui and *Easwaran* are discussed above. *Conroy* does not supplement the deficiencies of *Usui* and *Easwaran*. *Conroy* is directed generally to a process for removing a ceramic core from an investment-type casting. The process of *Conroy* is used with *castings that have been removed from the mold* and that have an exposed core, that is, a core that communicates directly with the outside or ambient (col. 3, line 43; FIG. 1). The exposed core portions pass over and communicate with the discharge ends of fluid spray nozzles, which discharge a core dissolving fluid (col. 4, lines 8-10). There is nothing within *Conroy* that teaches or suggests processing the core while the casting is still in the mold.

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More particularly, as regards claims 68-73 and 75, which depend directly or indirectly from amended claim 67, *Conroy* does not teach or suggest pre-heating the mold to a desired pre-heating temperature for the metal of the casting. Additionally, *Conroy* does not teach or suggest a method of processing a metal casting including impinging the core with a heated fluid directed through an access opening in the mold, where impinging the core with a heated fluid at least partially degrades the core, at least partially heat treats the casting within the mold, or a combination thereof.

As regards claim 85, which depends from amended claim 84, *Conroy* does not teach or suggest use of a process control temperature station downstream from the pouring station, where the process control temperature station includes a second heat source for maintaining the metal at or above a process control temperature as the metal at least partially solidifies, where the process control temperature is the temperature below which, for every one minute of time the temperature of the casting decreases, more than one minute of heat treatment is required to attain the desired properties of the casting.

4. **Claims 74, 87, and 88 (*Usui/Easwaran/Crafton '094/Crafton '046*)**

Claim 74 depends from claim 67. Claims 87 and 88 depend from claim 84. In view of the amendments to claims 67 and 84, it is submitted that the rejection of claims 74, 87, and 88 is obviated and should be withdrawn.

Usui and *Easwaran* are discussed above. With respect to the rejection of claims 74, 87, and 88, *Crafton '094* and *'046* (collectively "*Crafton*") do not supplement the deficiencies of *Usui* and *Easwaran*. *Crafton* relates generally to a system for removing and reclaiming a sand core from a casting during heat treatment using an oxygenated atmosphere to combust the binding in the core. More particularly, as regards claim 74, which depends from amended claim 67, *Crafton* does not teach or suggest pre-heating the mold to a desired pre-heating temperature for the metal of the casting. Additionally, *Crafton* does not teach or suggest a method of processing a metal casting including impinging the core with a heated fluid directed through an access opening in the mold, where impinging the core with a heated fluid

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at least partially degrades the core, at least partially heat treats the casting within the mold, or a combination thereof.

Further, as regards claims 87 and 88, which depend from amended claim 84, *Crafton* does not teach or suggest use of a process control temperature station downstream from the pouring station, where the process control temperature station includes a second heat source for maintaining the metal at or above a process control temperature as the metal at least partially solidifies, where the process control temperature is the temperature below which for every one minute of time the temperature of the casting decreases, more than one minute of heat treatment is required to attain the desired properties of the casting.

5. Summary

Given that none of *Easwaran*, *Usui*, *Conroy*, *Crafton*, or any combination thereof, teach or suggest each and every element of Applicant's claimed invention, it is submitted that the references are insufficient to support a rejection of amended claims 67, 84, and their associated dependent claims 68-75 and 85-88 under 35 U.S.C. §103(a). Thus, it is requested respectfully that this rejection be withdrawn.

B. Rejection of claims 76-83 (*Easwaran/Ryan*)

Claims 76-83 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Easwaran* in view of *Ryan et al.* Claim 81 is canceled hereby. Claims 77-79 depend directly or indirectly from claim 76. Claims 82 and 83 depend directly or indirectly from claim 80. In view of the amendments to claims 76 and 80, it is submitted that this rejection is obviated and should be withdrawn.

Easwaran teaches pouring a molten metal into a ceramic shell supported in a particulate medium. The solidifying metal is maintained at the appropriate heat treatment temperature, while being supported in a particulate medium, until the metal is heat treated (col. 5, lines 60-65). In sharp contrast, *Ryan* is directed to a particular stainless steel alloy (referred to as "X-11") that exhibits improved machinability and drillability when using an accelerated in-mold heat treatment (Abstract; col. 2, line 67 through col. 3, lines 1-4; col. 3, lines 53-54). The method of *Ryan* teaches controlling the rate of cooling of inside and outside

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temperature of the X-11 casting "so that both temperatures slowly decrease at the same rate" (col. 3, lines 26-28). One of ordinary skill in the art would not seek to supplement the teachings of *Easwaran*, directed to a method of forming an investment-type mold and heat treating a casting therein, with a reference about improving the machinability and drillability of the X-11 metal alloy. Thus, there is no motivation to combine the reference teachings and no reasonable expectation that the two references would result in a successful combination.

Furthermore, it is submitted respectfully that neither *Easwaran* nor *Ryan*, alone or in combination, teach or suggest all elements of Applicant's claimed invention as set forth in amended claims 76 and 80 and their associated dependent claims 77-79, 82, and 83.

With respect to amended claim 76 and its associated dependent claims 77-79, neither *Easwaran* nor *Ryan*, nor the combination thereof, teach or suggest a method of processing a metal casting including providing a mold with a degradable core comprising particulate matter and a binder, and introducing a heated fluid through at least one access opening in the mold, thereby at least partially heat treating the interior of the casting, at least partially degrading the core, or a combination thereof. In particular, neither *Easwaran* nor *Ryan*, nor the combination thereof, teach or suggest using a core to form a casting and, therefore, cannot teach impinging the core with a heated fluid to degrade the core at least partially. Similarly, since neither *Easwaran* nor *Ryan*, nor the combination thereof, teach or suggest using a core to form a casting, neither reference can teach or suggest impinging the core with a heated fluid to heat treat the casting at least partially.

With respect to amended claim 80 and its associated dependent claims 82 and 83, neither *Easwaran* nor *Ryan*, nor the combination thereof, teach or suggest a method of processing a metal casting including maintaining the temperature of the metal at or above a process control temperature for the metal, where the process control temperature is the temperature below which for every one minute of time the temperature of the casting decreases, more than one minute of heat treatment is required to attain the desired properties of the casting.

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Given that neither *Easwaran* nor *Ryan*, nor the combination thereof, teach or suggest each and every element of Applicant's claimed invention, it is submitted that the combination of *Easwaran* and *Ryan* is insufficient to support a *prima facie* case of obviousness of amended claims 76-83 under 35 U.S.C. §103(a).

III. NEW CLAIMS

New claims 103 and 104 are presented hereby. New claim 103, which depends from claim 67, is believed to be allowable in that none of the cited references teach or suggest the method of processing a metal casting presented therein, and because it adds an additional limitation or further defines the invention recited in claim 67. New claim 104, which depends from claim 76, also is believed to be allowable in that none of the cited references teach or suggest the method of processing a metal casting presented therein, and because it adds an additional limitation or further defines the invention recited in claim 76.

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CONCLUSION

The foregoing is submitted as a full and complete response to the Office Action mailed September 21, 2005, and is believed to place all claims in the application in condition for allowance. Such action is courteously solicited. If the Examiner believes that there are any issues that can be resolved by telephone conference, or if there are any informalities that may be addressed by an Examiner's amendment, the Examiner is invited to contact the undersigned at (404) 879-2437.

The Commissioner is hereby authorized to charge any fees due, or credit any overpayment, to Deposit Account No. 09-0528.

Respectfully submitted,



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